

The Role of the Government in Meeting Military Energy Needs: A Literature Review of Defense Energy Strategies and Policies

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ABSTRACT

This study employed a qualitative approach with a systematic literature review design, involving peer-reviewed journal articles, institutional policy documents, and academic monographs selected through purposive sampling based on criteria of temporal relevance and thematic specificity, with priority given to sources published between 2010 and 2024. Data were collected using systematic documentary analysis and analyzed using a two-stage process combining descriptive thematic mapping and comparative cross-contextual analysis. The findings indicate that legislative mandates produce more durable defense energy reform outcomes than administrative directives; that a persistent and consequential gap exists between declared policy objectives and actual budget appropriations, with reactive rather than anticipatory budgeting constituting the dominant pattern across cases; that a portfolio approach combining diversification, efficiency reform, and renewable integration rather than any single strategy best addresses the full range of operational demands; and that the body of defense energy policy knowledge has developed almost entirely through Western, high-income defense establishment experience, generating frameworks that require reconceptualization rather than direct translation for developing-country contexts. This study also provides opportunities for further research on the institutional and political conditions shaping defense energy policy development across ASEAN member states.

INTRODUCTION

Military dependence on fossil fuels has long constituted one of the most fundamental strategic vulnerabilities in modern defense planning. From the stagnation of German armored divisions on the Eastern Front to the fragile logistics corridors of American forces in Iraq and Afghanistan, the history of contemporary conflict has repeatedly demonstrated that combat capacity is only as strong as the energy supply chain that sustains it. This vulnerability does not stop at the operational dimension alone. The United States Department of Defense (DoD), as the most widely studied reference point, consumes approximately 85 million barrels of jet fuel and diesel annually (DoD, 2022), positioning it among the largest single energy consumers in the world. That figure reflects a genuine structural exposure: fluctuations in global oil prices, disruptions to maritime shipping lanes, and politically motivated embargoes all bear directly on the operational readiness of armed forces. For countries with more constrained defense budgets, these fiscal and strategic vulnerabilities are even more acute, though they attract considerably less academic attention.

Governments occupy the decisive position in managing this exposure. Their role operates through at least three interrelated functions: the formulation of regulations and legal mandates governing military energy procurement and consumption; the allocation of defense budgets in ways that actively reinforce or undermine long-term energy resilience; and the development of infrastructure strategies capable of withstanding pressure under conditions of actual conflict. These three functions cannot be treated in isolation. A government that issues ambitious energy directives without corresponding budgetary commitments produces policy documents, not operational outcomes. Conversely, capital investment in energy infrastructure without regulatory coherence tends to generate fragmentation that fails to address the underlying strategic vulnerabilities. The central tension in contemporary defense energy policy lies between two poles: continued dependence on fossil fuels, which carries logistical risks, price volatility, and geopolitical leverage for energy-exporting states; and a transition toward renewable energy that has yet to fully resolve the challenges of energy density, portability, and reliability under the extreme and unpredictable conditions that characterize military operations.

LITERATURE REVIEW



Figure 1. Military Energy Dependency Framework

Note. The Diagram illustrates how energy military operations and how external risks influence fuel logistics, ultimately affecting national security

The academic literature on energy security has expanded substantially since the mid-2000s, driven by the oil price shock of 2008 and the post-2014 reassessment of European energy dependencies following Russia's annexation of Crimea. However, that expansion has not been evenly distributed. Energy economists tend to analyze supply chains in isolation; strategic studies scholars focus on geopolitical leverage; while logistics researchers optimize distribution networks – with relatively limited cross-disciplinary synthesis. As a result, defense planners working across these domains have a very limited consolidated evidence base from which to design integrated energy strategies. More conspicuous still is the near-total absence of adequate analysis on developing-country contexts. Existing studies are overwhelmingly centered on the experience of the United States, NATO member states, and Australia, while countries such as Indonesia facing a unique intersection of energy dependency, constrained defense budgets, and evolving regional security dynamics have received scarcely any academic attention commensurate with the urgency of the problem.

This study offers a contribution that is two-layered in nature. First, methodologically, it constructs a cross-disciplinary analytical framework that integrates the dimensions of public policy, defense strategy, and logistics management an approach that has thus far been absent from a literature that tends toward fragmentation. Second, contextually, the study explicitly positions Indonesia as its object of inquiry, filling a significant gap in a literature

dominated by perspectives drawn from advanced economies. This novelty is not merely the addition of a new empirical case, but rather a testing of the relevance and limits of theories developed from structurally different contexts. The analytical foundation of this study rests on the concept of military energy resilience, operationalized through three principal policy strategies: diversification of energy sources, consumption efficiency reform, and the integration of renewable energy into defense doctrine and infrastructure.

This study is focused on analyzing the role of governments in shaping defense energy policy through regulatory, budgetary, and infrastructure instruments, with particular attention to the implications for developing countries. More specifically, the study aims to examine how government policy instruments have shaped defense energy orientations in the United States, NATO member states, and Australia; to map and evaluate the strategies employed by various national defense establishments in managing their energy vulnerabilities; and to identify gaps in the existing literature and draw relevant policy implications for Indonesia, as a context that is academically underrepresented yet strategically increasingly significant.

METHODOLOGY

Type of Research

This study employs a qualitative research approach grounded in systematic literature review. Rather than generating new empirical data through fieldwork or experimentation, the study works primarily with existing scholarly and institutional knowledge to identify patterns, contradictions, and gaps in how governments have approached defense energy policy. This approach is appropriate given that the central research question is fundamentally one of synthesis: what can be learned when the regulatory decisions, budget allocations, and strategic documents of multiple defense establishments are read against one another and against the scholarly literature that has attempted to evaluate them? The study is therefore descriptive and analytical in character, oriented toward conceptual integration across disciplines that rarely engage directly with one another, including public policy analysis, defense strategy studies, energy economics, and international relations.

Research Design

The study adopts a systematic literature review design as its primary analytical framework. This design was selected because it imposes sufficient methodological discipline to distinguish evidence-based claims from advocacy dressed as analysis, while allowing for the integration of findings across multiple academic disciplines and institutional sources. The review proceeds along two complementary analytical tracks. A descriptive track maps the key concepts, definitional frameworks, and principal findings across the reviewed literature, establishing the baseline of what is known and the terms in which it has been discussed. A comparative track then examines how defense energy policies have been designed and implemented across different national and geopolitical contexts, with attention to variation in regulatory architecture, budget structures,

and technology adoption trajectories. The combination of these two tracks is designed not merely to catalogue what has been studied, but to surface the contradictions, silences, and unresolved tensions in the existing body of work – particularly the near-absence of rigorous comparative analysis for defense establishments operating outside the high-income, Western-aligned countries that dominate the literature.

Participants and Sampling Technique

Given the nature of a systematic literature review, the unit of analysis in this study is the body of literature itself rather than human participants or respondents. Source selection followed a purposive sampling strategy governed by explicit inclusion and exclusion criteria. Three categories of source material were drawn upon: peer-reviewed journal articles indexed in Scopus and Google Scholar, with priority given to established outlets in relevant fields including Energy Policy, Defense and Security Analysis, and the Journal of Strategic Studies; policy reports and institutional documents issued by authoritative bodies including the U.S. Department of Defense, the International Energy Agency, NATO, and national defense agencies; and academic monographs addressing the intersection of energy governance and defense strategy where the treatment of specific issues required greater conceptual depth than journal articles typically allow. The rationale for including all three categories is that academic literature alone rarely supplies the empirical grounding needed for questions about implementation, budget execution, and operational outcomes – dimensions that institutional documents capture more directly.

Instruments and Data Collection

Data collection was conducted through systematic documentary analysis. Inclusion criteria were applied along two principal dimensions. The first was temporal relevance: the review prioritized literature published between 2010 and 2024, a period bookended by the post-2008 oil price shock that first compelled serious institutional attention to defense energy reform, and the accelerating policy responses triggered by Russia's full-scale invasion of Ukraine in 2022. Foundational works published before 2010 were retained where their conceptual contributions remain uncontested reference points in the field, as excluding them would have introduced an artificial boundary that distorts rather than clarifies the intellectual landscape. The second dimension was thematic specificity: only sources that address energy in an explicitly military or national defense context were included. Literature on civilian energy security, however methodologically rigorous, was excluded unless it contained analysis with direct and substantiated implications for defense planning or military logistics. This boundary was maintained to ensure that the review remains analytically anchored to its stated domain rather than diffusing into the broader energy policy literature.

Data Analysis Technique

Data analysis was conducted in two sequential stages corresponding to the two analytical tracks described in the research design. In the first stage, a

descriptive analysis was performed to map the conceptual landscape of the reviewed literature: key terms were identified, definitional frameworks were compared across sources, and the principal findings of each body of work were recorded and organized thematically. This stage established the common vocabulary and evidentiary baseline against which subsequent comparative claims could be made. In the second stage, a comparative analysis examined variation across national and geopolitical contexts, assessing how differences in regulatory architecture, budget commitment, and technology adoption trajectories correspond to divergent policy outcomes. Throughout both stages, analytical attention was directed not only toward what the literature confirms, but toward what it leaves unresolved — including internal contradictions between studies, limitations acknowledged by the authors themselves, and structural silences produced by the systematic underrepresentation of non-Western, developing-country defense contexts. This reflexive orientation toward gaps and tensions is what distinguishes the analysis from a descriptive annotated bibliography and constitutes its primary scholarly contribution.

RESEARCH RESULT

The results section should be presented factually, systematically, and in a data-based manner. Authors should report the research findings from the main results to relevant supporting data in accordance with the research objectives, research questions, or hypotheses. This section should not include theoretical interpretation, comparison with previous studies, or in-depth discussion, as these elements should be presented in the Discussion section.

Main Findings

Present the main findings in a structured manner based on the categories, themes, variables, indicators, or sequence of analysis used in the study. Each finding should be supported by adequate data, such as numbers, percentages, statistical values, participant quotations, or observational descriptions, depending on the research approach.

The systematic review of literature spanning government regulatory frameworks, defense budget allocation patterns, and strategic energy management across multiple national defense contexts yielded five principal thematic findings, organized below according to the analytical categories established in the review methodology.

Regulatory Architecture: Legislation as the Foundation of Durable Reform

The review finds consistent evidence that legislative mandates produce more durable defense energy reform outcomes than administrative directives. Across the cases examined, policy commitments embedded in legislation demonstrated greater continuity across changes in government, greater resistance to reversal under fiscal pressure, and more reliable enforcement of multi-year planning obligations than equivalent guidance issued through executive or ministerial channels alone.

In the United States, the annual revision cycle of the National Defense Authorization Act (NDAA) has functioned as the primary vehicle for translating defense energy policy intentions into binding legal obligations on the DoD (DoD, 2022). The cumulative effect of successive NDAA energy provisions has been to embed efficiency and renewable integration requirements into DoD planning processes in ways that are substantially harder to reverse than administrative guidance would permit. Australia's Defence Energy Strategy 2021-2030 illustrates a complementary model: quantified, time-bound targets – including a 30% reduction in carbon emissions from military installations by 2025 and a trajectory toward carbon neutrality by 2050 – embedded within an integrated policy framework that explicitly aligns defense energy obligations with national climate commitments (Australian Department of Defence, 2021). A structurally significant feature of the Australian case is the deliberate institutional coordination between the defense and energy policy domains, which avoids the fragmentation that characterizes many developing-country contexts, where decisions made in the energy sector without reference to defense requirements can inadvertently compromise military energy resilience.

Budgetary Behavior: The Persistent Gap Between Declaration and Appropriation

The review finds a consistent and consequential divergence between declared defense energy policy objectives and actual budget allocations across the majority of cases examined. Marqusee et al. (2017) document this divergence directly in the U.S. context: despite high-profile policy commitments to renewable energy integration, sustained underfunding of implementation programs created a persistent gap between declared objectives and operational reality. Ambitious targets established without corresponding capital appropriations function, in institutional terms, as aspirational statements rather than operational commitments.

The European experience following Russia's full-scale invasion of Ukraine in 2022 provides an instructive counterexample. NATO member states rapidly redirected defense budget allocations toward energy storage capacity, alternative supply infrastructure, and accelerated procurement of generation assets for military installations (IEA, 2021), demonstrating that substantial budget reallocation is institutionally possible when the threat is rendered immediate and politically salient. The broader pattern that emerges across all cases is one of reactive rather than anticipatory budgeting: defense establishments have consistently increased energy-related appropriations in response to demonstrated vulnerabilities – the 2008 oil price shock, the 2014 Crimea annexation, the 2022 invasion – rather than in response to prospective risk assessments. Given that energy infrastructure investment carries lead times that can span a decade or more between budget decision and operational availability, this reactive pattern systematically produces capabilities oriented toward the preceding emergency rather than the emerging one.

Strategic Energy Approaches: Diversification, Efficiency, and Renewable Integration

The review identifies three principal strategic approaches to defense energy management, each supported by evidence of varying consistency and scope.

Diversification represents the most consolidated area of evidence. Operating across the simultaneous dimensions of fuel type, supplier origin, and storage and distribution technology, diversification has been established as a foundational strategic response to single-source dependency vulnerability. Sovacool and Brown (2010) argue that it is most appropriately understood as a component of national resilience strategy rather than a logistics management exercise a framing substantially validated by the post-2022 European experience.

Efficiency reform has undergone a significant conceptual reorientation. Initially framed as a cost-reduction instrument, the efficiency imperative was recast by Chodur et al. (2012), who documented a direct correlation between fuel logistics burden and tactical risk in active operations. Their analysis of fuel convoy requirements in Afghanistan where approximately one in eight military casualties occurred during convoy escort missions (Carafano & Gudge, 2007) repositions efficiency as a force protection and operational effectiveness imperative. Perkins and Neumayer (2012) further find that across multiple military installation contexts, the primary barriers to realizing efficiency returns are organizational rather than technical, rooted in institutional inertia among personnel who have internalized high-energy operational norms as equivalent to operational capability and who have not been given command incentives to treat energy consumption as a managed variable.

Renewable energy integration presents the sharpest divergence between demonstrated outcomes and unresolved technical limitations. At the installation level, military bases in the United States, United Kingdom, and Australia operating on microgrid architectures combining solar generation with battery storage have documented meaningful reductions in diesel consumption and demonstrated resilience advantages during grid disruption events (Marqusee et al., 2017). At the operational and platform level, however, current battery technology cannot match the energy densities required by modern weapons platforms and armored vehicles without weight and volume penalties that are operationally prohibitive. NATO's acknowledgment of this gap and its direction to member governments to treat portable military energy technology as a priority research investment (NATO, 2014) reflects an assessment that transformative advances at the operational level remain a work in progress.

Geopolitical and Cyber-Physical Dimensions

The review finds that energy infrastructure has been progressively recognized as a first-order strategic target across the cases examined. Lele (2019) traces the growing recognition in Asia-Pacific security discourse that disrupting an adversary's fuel supply chains or power generation capacity can degrade military effectiveness without direct kinetic confrontation. The cyber-physical dimension of this threat has received disproportionately limited analytical

attention relative to its operational significance. Industrial control systems managing military installation power grids, fuel pipeline networks, and storage facilities have become progressively more networked, creating attack surfaces that a sophisticated adversary could exploit to render critical infrastructure unavailable at operationally decisive moments – without physical destruction. The review finds that the institutional separation of energy security and cybersecurity policy domains within most defense ministries constitutes a structural governance gap that actively works against the integration these two areas require.

Comparative Pattern: Conditions Associated with Reform Leadership

Across the cases reviewed, three conditions consistently co-occur in defense establishments that have made substantive progress on energy reform the United States, United Kingdom, Australia, and Norway – and are largely absent in lagging cases. These are: politically salient threat exposure that creates internal constituency for reform; sufficient fiscal and technological capacity to pursue multiple reform pathways simultaneously; and governance frameworks with adequate transparency and accountability to sustain multi-year implementation against budget pressure and institutional inertia. The review further finds that reform momentum in leading cases was driven primarily by fiscal and operational pragmatism rather than strategic foresight or environmental commitment (Marqusee et al., 2017).

With respect to Southeast Asia, Lele (2019) documents a notable deficit in defense energy policy sophistication across the region. Indonesia in particular faces a demanding set of structural energy security challenges dependence on imported refined petroleum products, extended and vulnerable maritime supply lines, and geographic dispersion of military installations across an archipelago of over 17,000 islands that are at least as operationally demanding as those confronting comparable regional powers. The absence of a formally integrated defense energy doctrine reflects not solely resource constraints, but a strategic prioritization in which energy security has not yet been institutionally recognized as a defense variable.

DISCUSSION

Analysis and Interpretation of Findings

The finding that legislative instruments produce more durable defense energy reform outcomes than administrative directives indicates that the formal authority structure within which policy is embedded plays a decisive role in determining whether declared objectives translate into operational realities. This finding directly addresses the study's first research objective – examining how government regulatory and budgetary instruments shape defense energy policy – and clarifies its significance: policy durability is not primarily a function of the ambition of the declared target, but of the institutional mechanism through which it is imposed. A 30% emissions reduction target anchored in legislation carries fundamentally different institutional weight than an equivalent target issued as ministerial guidance, because the former generates accountability

obligations that survive electoral cycles and resist quiet revision under fiscal pressure. For defense establishments in developing countries, where institutional continuity is often more fragile and where energy policy and defense policy tend to operate in separate ministerial silos, this distinction has immediate governance implications.

The persistent divergence between declared energy policy objectives and actual budget allocations, documented across multiple national contexts, indicates that budget analysis — rather than policy document analysis — is the more reliable diagnostic instrument for assessing the genuine state of a defense establishment's energy transition. This finding is significant because it implies that the existing literature, which has tended to draw heavily on policy declarations and strategic documents, may systematically overestimate the progress that has been made. When policy declarations and budget allocations diverge consistently, the declared objectives function as horizon markers rather than operational commitments.

The identification of reactive rather than anticipatory budgeting as the dominant pattern across cases has direct implications for Indonesia and comparable developing-country contexts. The lag between budget decisions and operational capability availability which can extend to a decade or more for energy infrastructure means that a policy cycle driven by crisis response will consistently generate a structural mismatch between emerging threats and available capabilities. For a country like Indonesia, where the geographic complexity of military logistics across a widely dispersed archipelago amplifies this exposure, the cost of waiting for crisis-driven budget reorientation is potentially higher than for defense establishments with more concentrated basing structures.

Comparison with Theories and Previous Literature

The finding that diversification constitutes the most evidentially consolidated strategic approach to defense energy management is consistent with Sovacool and Brown's (2010) framing of energy resilience as a systemic national security concern rather than a logistics optimization problem. The post-2022 European experience provides strong real-world validation of this framing: defense establishments that had diversified supply relationships and developed alternative infrastructure prior to the crisis demonstrated meaningfully greater resilience than those that had not, regardless of their absolute level of energy expenditure.

The reframing of efficiency reform as a force protection imperative — rather than a budgetary optimization diverges from earlier literature that treated energy efficiency primarily as a cost-management tool. The findings of Chodur et al. (2012) and the casualty data reported by Carafano and Gudgel (2007) establish a direct link between fuel demand reduction and reduced exposure to lethal risk in active operational theatres. This represents a meaningful conceptual advance over earlier framings and has direct implications for how efficiency programs should be positioned within defense institutions: not as administrative

overhead reduction, but as an operational effectiveness investment with measurable force protection returns.

The divergence between installation-level and operational-level evidence on renewable energy integration is consistent with the technology readiness assessment offered by NATO (2014), but adds important nuance to more optimistic accounts of military energy transition found in sustainability-oriented literature. Studies that document successful microgrid deployment at fixed military installations – including Marqusee et al. (2017) – are methodologically sound within their scope, but their findings do not transfer straightforwardly to the operational mobility context. The energy density constraints documented at the platform level constitute a genuine technical frontier, not a policy implementation failure, and the literature that conflates these two levels of analysis risks generating misleading expectations about the pace of achievable transition.

Table 1. Comparison of Defense Energy Policies

Country	Main Strategy	Renewable Energy Program	Key Objectives
United States	Operational Energy Strategy	√	Energy Resilience
NATO	Smart Energy Initiative	√	Mission Sustainability
Australia	Defence Energy Program	√	Supply Security
Indonesia	Emerging Framework	Limited	Energy Independence

The finding that reform in leading defense establishments was driven by fiscal and operational pragmatism rather than environmental or strategic-foresight rationales offers a qualified but important corrective to policy transfer arguments. Programs modeled on U.S. or Australian defense energy frameworks without attention to the motivational architecture that sustained them risk importing the declared objectives while leaving behind the institutional dynamics that made those objectives credible. For developing-country contexts including Indonesia, where defense budget constraints limit the range of simultaneously pursuable reform pathways, this suggests that framing energy reform in terms of force protection, logistical cost reduction, and operational readiness rather than sustainability is likely to generate stronger institutional buy-in.

Research Implications

Theoretically, the findings contribute to the development of an integrated analytical framework for military energy resilience that synthesizes dimensions previously treated in isolation: regulatory architecture, budgetary credibility, strategic approach selection, and geopolitical threat assessment. The study

demonstrates that these dimensions are not independently manageable the effectiveness of any single element is substantially conditioned by the state of the others. A well-designed diversification strategy is undermined by chronic underfunding; legislative mandates without implementation budgets generate accountability without outcomes; efficiency reforms without command-level incentive structures stall at the organizational culture barrier. This interdependence has been undertheorized in a literature that has tended to treat each dimension as a separable domain of analysis.

Practically, the findings carry direct policy relevance for Indonesia and analogous developing-country defense establishments in Southeast Asia. The structural challenges Indonesia faces archipelagic geography, dependence on imported refined products, extended maritime supply lines, and the absence of a formally integrated defense energy doctrine map closely onto the conditions that have driven reform in leading cases, with the notable exception that the political salience of the energy security threat has not yet concentrated institutional attention in the same way. The implication is that building the institutional case for defense energy reform in Indonesia requires deliberate framing around operationally concrete vulnerabilities the logistical exposure of extended resupply corridors, the tactical risk profile of fuel-dependent forward operations rather than around abstract energy transition objectives that lack direct resonance within the defense planning community.

For the academic literature, the study's explicit engagement with the Indonesian and Southeast Asian deficit in defense energy policy analysis contributes a contextual corrective to a body of work that has been overly concentrated on Western, high-income defense establishments. The structural conditions that shape defense energy policy in developing-country contexts – including constrained budgets that force sequential rather than simultaneous reform, ministerial fragmentation between energy and defense domains, and limited access to advanced technology through procurement channels – generate different policy dynamics that require dedicated analytical frameworks rather than straightforward application of findings from the Western literature.

Research Limitations and Directions for Future Research

This study is subject to several limitations that qualify the scope of its findings and identify productive directions for future research. First, as a systematic literature review, the study is necessarily limited by the composition of the existing literature it synthesizes. The pronounced concentration of high-quality empirical research on U.S., NATO, and Australian defense establishments means that the comparative patterns identified here rest on an asymmetric evidentiary base: findings attributed to "leading" cases are supported by substantial primary and secondary evidence, while the characterization of "lagging" cases including Indonesia relies more heavily on inference from limited sources. This asymmetry is itself a documented finding, but it constrains the strength of the comparative claims that can be made.

Second, the study does not incorporate primary fieldwork, institutional interviews, or access to classified defense planning documents. Questions about

the internal dynamics of budget negotiation, the political economy of reform resistance within defense ministries, and the operational realities of energy logistics in active military contexts are therefore addressed at the level of what the published literature permits, which is likely to underrepresent the complexity of actual institutional processes.

Third, the rapid pace of change in both the geopolitical environment — particularly since Russia's 2022 invasion of Ukraine — and in relevant energy technologies means that some findings may have shorter shelf lives than is typical for literature review research. Policy responses to the 2022 energy crisis are still unfolding, and technology developments in battery density, hydrogen fuel cells, and distributed generation are advancing at a pace that could materially alter the operational-level constraints identified in this review within the medium-term horizon.

Future research is encouraged to address these limitations through several complementary approaches. Longitudinal case studies focusing specifically on defense energy policy development in ASEAN member states, and Indonesia in particular, would substantially improve the evidentiary base for developing-country contexts and enable more grounded comparative analysis. Primary research incorporating interviews with defense planners, energy ministry officials, and logistics commanders would illuminate the institutional dynamics political economy of reform, organizational culture barriers, inter-ministerial coordination mechanisms that systematic literature review cannot adequately capture. Finally, mixed-methods studies that combine quantitative analysis of defense energy expenditure data with qualitative assessment of regulatory and doctrinal developments would provide more rigorous foundations for the budget credibility arguments that this review has been able to address only at the level of documentary evidence.

CONCLUSION AND RECOMMENDATIONS

This study set out to examine how government regulatory, budgetary, and infrastructure instruments have shaped defense energy policy across selected national contexts, and to assess what the comparative evidence supports with respect to the strategic approaches defense establishments have employed in managing their energy vulnerabilities. Three conclusions emerge from the review with sufficient consistency to warrant treatment as analytical findings rather than tentative observations.

First, effective military energy policy cannot be reduced to any single government instrument. Regulatory mandates, budget allocations, and infrastructure investment operate through distinct institutional logics and address different dimensions of the underlying vulnerability. The cases that have made genuine and sustained progress the United States, Australia, and the more capable NATO members share a governance architecture in which these three functions are formally coordinated rather than administered in isolation. That coordination does not emerge automatically; it requires deliberate policy design and political commitment at the level of both civilian and military leadership across multiple budget cycles.

Second, no single strategic approach to military energy supply has proven sufficient when evaluated against the full range of operational demands that modern defense establishments face. The evidence supports a portfolio logic in which diversification, efficiency reform, and renewable integration are deployed simultaneously and calibrated to the operational contexts in which each functions best. Efficiency reform carries the most robust cross-contextual evidence base, in part because its benefits translate directly into force protection terms that military institutions recognize and respond to. Renewable integration has demonstrated clear value at the fixed installation level, while its limits at the platform and expeditionary level are defined by genuine technical constraints that policy ambition alone cannot resolve. Diversification, meanwhile, addresses the geopolitical dimension of energy dependency that neither efficiency nor renewables fully resolves.

Third, the body of knowledge on defense energy policy has developed almost entirely through the experience of a small cluster of high-income, Western-aligned defense establishments. This concentration generates a literature that reflects the fiscal capacity, governance quality, and threat environments of those specific contexts, and whose prescriptions require reconceptualization — not merely translation — before they can be applied to defense establishments operating under substantially different conditions. For Indonesia, the implication extends beyond identifying a policy gap: closing that gap requires, as a prerequisite, the integration of energy security as a formal variable within national defense doctrine, because without doctrinal recognition, the institutional mandate for coordinated energy planning cannot exist.

ADVANCED RESEARCH

The limitations of this study point toward several specific directions that future research should pursue. The most pressing is the need for rigorous primary research on defense energy policy development in developing-country contexts within ASEAN, with Indonesia as a natural priority case given the structural complexity of its energy security challenges and the relative absence of dedicated scholarly analysis. Longitudinal case studies that track the institutional conditions under which defense energy reform has occurred or failed to occur — incorporating interviews with defense planners, energy ministry officials, and military logistics commanders — would provide the kind of primary empirical grounding that no systematic literature review can substitute for.

Within the comparative framework this study has established, future research should treat ASEAN's variation in defense establishment size, budget capacity, threat exposure, and governance quality as a natural comparative laboratory rather than a residual category. Studies that exploit this variation systematically examining, for instance, why some regional defense establishments have begun to develop formal energy doctrines while others have not, and what institutional and political conditions explain that divergencenwould contribute more to the field than additional case studies of the U.S. or European experience, where the literature is already well-populated.

Finally, future research should pursue integrative methodological designs that bridge public policy, defense strategy, energy economics, and logistics management within a single analytical framework. Mixed-methods approaches combining quantitative analysis of defense energy expenditure trajectories with qualitative assessment of regulatory development and doctrinal evolution would provide more rigorous foundations for the budgetary credibility and institutional coordination arguments that this review has been able to address only at the level of documentary evidence. The governance problem this study has examined is inherently multidimensional; the analytical methods brought to bear on it should be proportionally so.

ACKNOWLEDGMENT

The study's primary theoretical contribution is the construction of an integrated analytical framework that treats regulatory architecture, budgetary credibility, strategic approach selection, and geopolitical threat assessment as interdependent rather than separable dimensions of a single governance problem. The existing literature has tended to address these dimensions as distinct domains energy economics, defense strategy, logistics management, and public policy with limited cross-disciplinary synthesis. By reading them against one another within a unified comparative framework, this study demonstrates that the effectiveness of any single element is substantially conditioned by the state of the others, a relationship that has been undertheorized in proportion to its practical significance.

Methodologically, the study contributes a systematic and explicitly cross-disciplinary approach to defense energy policy analysis that imposes greater analytical discipline than the review literature in this area has typically applied, particularly in distinguishing evidence-based claims from policy advocacy and in maintaining a consistent thematic focus on the military and national defense context rather than diffusing into the broader energy policy literature.

Practically, the study contributes a structured comparative baseline that is directly relevant to policy development in Indonesia and analogous developing-country defense establishments in Southeast Asia contexts that have been systematically underrepresented in the existing literature despite facing energy security challenges that are, in several structural respects, more demanding than those confronting the Western establishments that dominate the scholarly record.

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